REMARKS

In accordance with the foregoing, claims 13, 16, 22 and 23 have been amended. Claims 1-23 are pending and under consideration.

REJECTION UNDER 35 U.S.C. §102:

Claims 13 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Haselby et al. (U.S. Patent No. 5,250,956).

Claim 13 has been amended to recite "none zero error distance" to clarify the present invention.

Regarding claim 13, the Office Action sets forth that "an apparatus (fig.6) for measuring an image alignment error for image formation in an image forming apparatus having a carriage (fig. 6), the apparatus comprising: a test mark print-directing unit which prints first and second test marks on a printing medium according to a designated error distance." (fig. 13a, designated error distance is o, column 14, lines 37-45)

By way of review, Haselby et al. "After sensor calibration, background values for the test area are determined, first and second vertical test lines at a selected swath location are printed in each of the carriage scan directions by the cartridge being aligned, and the horizontal positions of thee vertical lines relative to each of the are determined to arrive at data shift and. R timing delay corrections. The test pattern produced would be one of three possible test patterned as represented three pairs of vertical lines (a),(b),(c) in FIG. 13."(col. 14, lines 37-45). Therefore, Haselby et al. teaches "an actual marking distance error between two vertical marks is 0" but not "designated error distance is 0" as recited in claim 13.

In addition, in present invention, paragraph[0016] of the present invention sets forth that "the designated error distance represents a distance arbitrarily designated with respect to the two test marks when the two test marks are printed." It is not actual distance between the test marks but only a designated distance between two marks. The Examiner alleges that Haselby et al. teaches "designated error distance is 0" can be detected using two marks. Designated error "0" means a –ref and a-F(or a-R) are folding each other according to the Examiner's assertion. If so, there is no movement of recording head. Therefore, designated error "0" means not printing two marks but only one mark according to Examiner and is not what the claimed is.

As such, it is respectfully submitted Haselby et al. does not disclose the invention as recited in claim 13.

Claim 22 has been amended to recite "non-zero error distance" which is not disclosed in cited arts.

As such, it is respectfully submitted that Ikeda does not disclose the invention as recited in claim 22.

Claims 7-10, 12-15, 20, 21, and 23 are rejected under 35 U.S.C. § 102(e) as being anticipated by Ikeda (U.S. Patent No. 6,607,260).

Regarding claim 7, the Office Action sets forth that Ikeda discloses "a test mark print-directing unit (fig. 3) which directs the carriage to print two test marks (figs.1 and 4, a-F and a-R) separated from each other by a designated error distance(0) on a printing medium on which images are printed."(col. 13, lines 57-65)

By way of review, Ikeda discloses "[a] scanning controller 19 includes a motor 107 for moving the carriage 101 (main scanning), a driver of the motor 107, a motor 112 for transferring the recording medium (sub-scanning), and a driver for the motor 112 in order to during normal recording operation, and to control them so as to carry out mail scanning and/or sub-scanning at a specified speed while reading data on the recorded images used for recording position correction processing" (col. 13, lines 57-65) however fails to disclose "a test mark print-directing unit which directs the carriage to print two test marks separated from each other by a designated error distance on a printing medium on which images are printed" as recited in claim 7.

Further, the Office Action sets forth that "a test mark print-directing unit (fig.3) which directs the carriage to print two test marks (figs. 1 and 4, a-F and a-R) separated from each other by a designated error distance (0) on a printing medium on which images are printed (column 13, lines 57-65, column 14, lines 13-30)."

By way of review, Ikeda sets forth "A scanning controller 19 includes a motor 107 for moving the carriage 101 (main scanning), a driver for the motor 107, a motor 112 for transferring the recording medium (sub-scanning), and a driver for the motor 112 in order to appropriately control the carriage and the recording medium during normal recording operation, and to control them so as to carry out main scanning and/or sub-scanning at a specified speed while reading data on the recorded images used for recording position correction processing."(col. 13, lines 57-65) and "[f]irst, during main scanning in the forward direction executed by the recording head A, a reference image (shown by reference "a-ref1" in FIGS. 1 and 4) extending in the sub-scanning direction is formed at a predetermined position on the recording medium, for example, in this embodiment, near the left end of the recording medium. In addition, the same recording head A is used to form images a-F and a-R at predetermined positions on the recording medium 114 during main-scanning movements of the carriage in the forward and reverse directions, as shown in the

upper parts of FIGS. 1 and 4, the images being linearly continuous in the recording medium feeding direction. The predetermined positions are theoretical ones at which the two images a-F and a-R are aligned in a sub-scanning direction, and essentially, without the offset of the recording position between the two directions, the distances in the main scanning direction between each of the two images and the reference image a-ref1 located to the left thereof are equal."(col. 14, lines 13-30) Further, the Examiner specially alleges a designated error distance (0) on a printing medium on which images are printed.

As noted above, an aspect of present invention, an apparatus for measuring image alignment is provided for measuring for errors but the Examiner asserts a designated error distance is "0" which means no error. As such, Ikeda only checks no error using two marks but fails to disclose "a test mark print-directing unit which directs the carriage to print two test marks separated from each other by a designated error distance on a printing medium on which images are printed" as recited in claim 7. Further, claim 7 recites "an error distance detecting unit which detects an actual error distance of the two test marks using the measured instants of time and a moving speed of the carriage, and outputs the detected actual error distance."

As such, it is respectfully submitted that Ikeda at least fails to disclose "a test mark sensing unit which senses only the two test marks, for the measuring of image alignment error", as recited in claim 7, for example, as well as the claimed detecting of an actual error distance based on the two test marks.

Regarding claim 10, the Office Action sets forth Ikeda discloses "the error distance detecting unit (fig. 3, element 13) detects a time difference between the measured instants of time the two test marks and multiplies the detected time difference by the moving speed of the carriage to output the detected actual error distance" (column 15, line 26)

By way of review, Ikeda discloses "Next, the data processing portion 13 in FIG. 3 calculates the amount of offset of the recording position between forward direction scanning and reverse direction scanning from the two count values loaded in the count data storage register 11. The amount of offset is calculated as follows: If the following definitions are made: velocity at which the carriage moves during image reading: V clock number count value obtained over a duration T1 in which the reference image a-ref1 and the recorded image a-F by the main-scanning in the forward direction are read (operation 1-1): C1, clock number count value obtained over a duration T2 in which the reference image a-ref1 and the recorded image a-R by the main-scanning in the reverse direction are read (operation 1-2): C2, and one clock period of the reference clock input to the counter: t, then the amount of offset of the bi-directional image recording position is determined by "(C1-C2)xtxV"."(col. 15, lines 5-26)

As noted above, in Ikeda, C1 deduces using a-reference 1 and a-F C 2 deduces using a reference a and a-R, therefore, in order to determine a amount of offset of the bi-directional image recording position, Ikeda has to utilize at least 3 marks.

As such, it is respectfully submitted that Ikeda does not disclose the invention as recited in claim 10.

Regarding claim 12, the Office Action sets forth "an image alignment correction value detection unit (fig. 3, element 13) which obtains a distance difference between the designated error distance and the actual error distance, detects an image alignment correction value from the distance difference, and outputs the detected image alignment correction value to compensate for the image alignment errors." (column 15, lines 6-39)

By way of review, Ikeda discloses "[n]ext, the data processing portion 13 in FIG. 3 calculates the amount of offset of the recording position between forward directions scanning and reverse direction scanning from the two count values loaded in the count data storage register 11. The amount of offset is calculated as follows: If the following definitions are made: velocity at which the carriage moves during image reading: V clock number count value obtained over a duration T1 in which the reference image a-ref1 and the recorded image a-F by the main-scanning in the forward direction are read (operation 1-1): C1, clock number count value obtained over a duration T2 in which the reference image a-ref1 and the recorded image a-R by the main-scanning in the reverse direction are read (operation 1-2): C2, and one clock period of the reference clock input to the counter: t, then the amount of offset of the bi-directional image recording position is determined by "(C1-C2)x txV"."(col. 15, lines 5-26). In addition, the resolution is defined by Vxt, so it is 1 m if, for example, V=0.5 m/s and t=2 sec. the mount of offset (a correction value) determined is supplied to the image recording position controller 15 shown in FIG. 3. Based on this amount of offset, the image recording position controller 15 then processes image data to be recorded and adjusts recording timings to control the subsequent image recording portion 17 so that the recording during bi-directional image recording, thereby enabling the bi-directional recording to be automatically corrected."(col. 15, lines 6-39)

As noted above, Ikeda determines an error distance using between a distance between two actual errors but not "a distance between the designated error distance and the actual error distance" as recited in claim 12.

As such, it is respectfully submitted that Ikeda does not disclose the invention recited in claim 12.

Regarding claim 13, the Examiner alleges that Ikeda discloses a test mark prints first and second test marks on a printing medium according to a designated error distance.(column 13,

lines 57,65, column 14, lines 13-30)" further, an error distance detecting unit (fig. 1, element 13) which detects only the first and second test marks for compensating for the image alignment error according to the detected the first and second test marks (the error distance detecting unit/optical sensor is capable of operating in the manner claimed)"

By way of review, Ikeda discloses "a scanning controller 19 includes a motor 107 for moving the carriage 101 (main scanning), a driver for the motor 107, a motor 112 for transferring the recording medium (sub scanning), and a driver for the motor 112 in order to appropriately control the carriage and the recording medium during normal recording operation, and to control them so as to carry out main scanning and/or sub-scanning at a specified speed while reading data ton the recorded images used for recording position correction processing."(col. 13, lines 57-65) but fails to disclose "a test mark prints first and second test marks on a printing medium according to a designated error distance" as recited in claim 13(emphasis added).

Furthermore, Ikeda discloses "[f]irst, during main scanning operation in the forward or reverse direction executed by the recording head A, a reference image (shown by reference "a-ref3" in FIGS. 1 and 10) extending in the main direction is formed at a predetermined position on the recording medium, for example, in FIG. 10, near the upper end of the recording medium. In addition, the recording heads A, B, C, D are used to carry out main scanning in the forward and reverse directions in order to simultaneously form images a-V, b-V, c-V, d-V at predetermined positions on the recording medium 114, the images being linearly continuous in the carriage movement direction (for simplicity, only the recorded images a-V and b-V are shown in FIG. 10). The predetermined positions are theoretical ones at which the recorded image a-V recorded by the recording head A, the recorded image b-V recorded by the recording head B, the recorded image c-V recorded by the recording head C, and the recorded image d-V recorded by the recording head D, which are all shown in FIG. 1, are aligned in a main scanning direction, and essentially, without the offset of the recording position of each recording head from the theoretical position, the distances in the main scanning direction between each of these images and the reference image a-ref3 located to the left thereof are equal."(col.14, lines 13-30-emphassis)

As noted above, Ikeda shows not only recorded images both a-V and b-V but also a-ref 3 but does not teach "an error distance detecting unit which detects only the first and second test marks for compensating for the image alignment error according to the detected the first and second test marks" as recite in claim 13.

As such, it is respectfully submitted that Ikeda does not disclose the invention as recited in claim 13.

Regarding claim 14, the Office Action sets forth Ikeda discloses a test mark print-directing unit (fig. 3) which directs the carriage to print first and second test marks on a printing medium according to a designated error distance (column 13, lines 57-65, column 14, lines 13-30) and

a test mark sensing unit (fig. 3, element 1) which senses only the first and second test marks(test mark sensing unit is capable of detecting only the two marks)."

By way of review, Ikeda discloses "a scanning controller 19 includes a motor 107 for moving the carriage 101 (main scanning), a driver for the motor 107, a motor 112 for transferring the recording medium (sub scanning), and a driver for the motor 112 in order to appropriately control the carriage and the recording medium during normal recording operation, and to control them so as to carry out main scanning and/or sub-scanning at a specified speed while reading data ton the recorded images used for recording position correction processing."(col. 13, lines 57-65) but fails to disclose "a test mark prints first and second test marks on a printing medium according to a designated non-zero error distance" as recited in claim 13(emphasis added).

Furthermore, Ikeda discloses "[f]irst, during main scanning operation in the forward or reverse direction executed by the recording head A, a reference image (shown by reference "a-ref3" in FIGS. 1 and 10) extending in the main direction is formed at a predetermined position on the recording medium, for example, in FIG. 10, near the upper end of the recording medium. In addition, the recording heads A, B, C, D are used to carry out main scanning in the forward and reverse directions in order to simultaneously form images a-V, b-V, c-V, d-V at predetermined positions on the recording medium 114, the images being linearly continuous in the carriage movement direction (for simplicity, only the recorded images a-V and b-V are shown in FIG. 10). The predetermined positions are theoretical ones at which the recorded image a-V recorded by the recording head A, the recorded image b-V recorded by the recording head B, the recorded image c-V recorded by the recording head C, and the recorded image d-V recorded by the recording head D, which are all shown in FIG. 1, are aligned in a main scanning direction, and essentially, without the offset of the recording position of each recording head from the theoretical position, the distances in the main scanning direction between each of these images and the reference image a-ref3 located to the left thereof are equal."(col.14, lines 13-30-emphassis)

As noted above, Ikeda shows not only recorded images both a-V and b-V but also a-ref 3 but does not teach "an error distance detecting unit which detects only the first and second test marks for compensating for the image alignment error according to the detected the first and second test marks" as recite in claim 14.

In addition, claim 15 is deemed to patentable due at least to the same reason as claim 14, as well as for the additional recitations therein.

Regarding claims 20 and 21, the Examiner rejects these two claims depending from independent claim 19 which is allowed. As such, it is respectfully submitted that the rejection of claims 20 and 21 be withdrawn and claims 20 and 21 be allowed.

In addition, claims 8-10 are deemed patentable due at least to their depending from claim 7, as well as for the additional features recited therein.

Further, claims 13 and 14 are also deemed patentable due at least the same reasons of claim 7, as well as for the additional limitations therein.

Claims 20, and 21 are amended to incorporate into allowed claim 19. As such, it is respectfully submitted that claims 20, 21 be allowed.

REJECTION UNDER 35 U.S.C. §103:

Claims 1-4, 6, 16, 17 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Haselby et al. in view of Ikeda.

Regarding claims 1 and 23, the Office Action acknowledges that Haselby et al. fails to disclose "hot the positions of the marks are determined. But the Office Action asserts that Haselby et al. discloses a method of measuring an image alignment error for image formation in an image forming apparatus having a carriage (fig. 6), the method comprising: directing the carriage to print first and second test marks on a printing medium according to a designated error distance (fig. 13a); sensing only the first and second test marks, for the measuring of the image alignment error, to output first and second sensed results of the first and second test marks; detecting an actual error distance of only the first and second test marks to compensate for the image alignment error(column 14, lines 37-45)." Furthermore, the Office Action asserts that Ikeda discloses "measuring

By way of review, Haselby et al. discloses "[t]he test pattern produced would be one of three possible test patterns as represented three pairs of vertical lines (a), (b), (c) in FIG. 13. The vertical lines (a) indicate that the spacing between the print cartridge and the print media is proper."(col. 14, lines 43-48).

However, claim 1 recites "printing two test marks separated from each other by a designated error distance on a printing medium on which images are printed"(emphasis added) but it is unclear how to the features are disclosed in Haselby et al. by the allegation of the examiner.

As noted above, FIG. 13 (a) merely shows that "the vertical lines indicate that the spacing between the printing cartridge and the print media is proper."

Furthermore, Haselby et al. "[a]fter sensor calibration, background values for the test area are determined, first and second vertical test lines at a selected swath location are printed in each of the carriage scan directions by the cartridge being aligned, and the horizontal positions of the vertical lines relative to each other are determined to arrive at data shift and/or timing delay corrections. The test pattern produced would be one of three possible test patterns as represented three pairs of vertical lines (a), (b), (c) in FIG. 13"(col. 14, lines 37-45)

It is noted that FIG. 13 merely teaches how to vertical test line are printed however fails to disclose "detecting an actual error distance of only the first and second test marks to compensate for the image alignment error" as recited in claim 1.

As such, it is respectfully submitted that the combination of Haselby et al. and Ikeda does not teach or suggest the features as recited in claim 1.

Claim 23 has been amended to recite "wherein the detecting of the actual error distance comprises: detecting an image alignment correction value by obtaining a distance difference between the designated error distance and the actual error distance."

Claim 23 also is deemed to patentable due at least the same reasons as claim 1, as well as for the additional recitations therein.

Regarding claims 16 and 17, the Office Action sets forth Haselby et al. discloses the claimed apparatus as evident from the discussion of the method claims above.

However the Office Action acknowledges that Haselby et al. does not disclose how the positions of time when marks are sensed to output measured instants of time and detecting an error distance using the measured instants of time (column 13, lines 48-50, column 14, line 63-column 15, line 10)

Claim 16 has been amended to recite "wherein the detecting of the actual error distance comprises detecting an image alignment correction value by obtaining a distance difference between the designated error distance and the actual error distance."

As such, it is respectfully submitted that the combination of Haselby et al. and Ikeda does not disclose or suggest the invention recited in claim 16.

Claim 17 is deemed patentable due at least to its pending from claim 16, as well as for the additional features recited therein.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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